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(54) **Hybrid integrated circuit component and printed circuit board mounting said component.**

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Description

This invention relates to a system of electrically connecting a hybrid integrated circuit to a printed circuit mother board.

Recently, the need for compact, lightweight electronic equipment of various kinds, such as video equipment, has been increasing remarkably. The challenge, therefore, is to achieve miniaturization and high density of electric circuit boards which constitute such equipment. A number of methods have been adopted as a means to achieve miniaturization and high density of circuit boards for various electronic equipment. One such method is to divide the entire circuit into several blocks to highly integrate each block to create a module, which is then fitted on a mother printed circuit board together with other circuit elements and connected with each other, thereby constituting a circuit substrate.

These highly integrated circuit block modules, generally called hybrid integrated circuits, are widely used for a variety of electronic equipment. They have played an important role in achieving not only compactness and lightweight but also high performance of electronic equipment.

The conventional hybrid integrated circuit, which has been entertaining widest acceptance is composed of a so-called "thick film circuit substrate", or alumina substrate 1, on the surface of which silver-type circuit conductors 2 and resistors are formed by means of printing; on which circuit elements 3, e.g layered ceramic condensers, resin-moduled transistors, and integrated circuit components such as semiconductor ICs are mounted and electrically connected to form a block circuit; and which is equipped with lead wires 4 as external connection terminals. However, the above-mentioned hybrid integrated circuit component had the following disadvantages:

1) High density of the circuit is hard to materialize, since the circuit block is provided on one side of the alumina substrate. Even if high density is achieved by constructing circuit blocks on both sides of the alumina substrate, very complicated manufacturing process makes the component far from being economical.

2) Since lead wires are used as external connection terminals, the reliability of connection between the circuit block and lead wires is insufficient.

3) The use of lead wires as external connection terminals hampers integration of circuit, due to complicated connection work as well as the need to provide space on the substrate constituting the block circuit for connection of lead wires.

4) Since lead wires are used as external connection terminals, the block circuit protrudes from the level of the mother printed circuit board when mounted on the mother printed circuit board, thereby preventing the effort to make the circuit substrate thinner.

5) Since an alumina substrate is used, the dimensions of the circuit block are constrained due to limited mechanical strength of the substrate.

6) Since a number of lead wires are connected, insertion of the terminals into the slot in the mother printed circuit board becomes difficult especially when the slot is small. If the slot is large enough on the contrary, the circuit block "floats" from the mother printed circuit board at the time of soldering.

These disadvantages have been the major obstacles in achieving miniaturization and high density of circuit substrates and improving reliability.

US—A—4,149,219 discloses a flexible printed circuit board assembly comprising a flexible insulative substrate on which upper surface a circuit pattern is formed and which carries circuit elements interconnected with the circuit pattern, four rigid circuit boards attached to the other surface of the printed circuit board wherein the rigid boards are spaced sufficiently apart so that the assembly can be folded. The assembly is designed for folding to occupy a minimum space.

US—A—4,250,536 discloses a pair of face-to-face hybrid integrated circuit boards mounted on a mother board at one edge and secured together at an opposite edge by means of a secondary circuit board.

With a view to overcoming the problems outlined above the invention provides in one aspect an electrical connection system of connecting a hybrid integrated circuit to a mother printed circuit board, the hybrid integrated circuit comprising a flexible insulative substrate, circuit conductor means formed on one surface of the substrate, circuit elements mounted on said one surface to said conductor means, and conductor terminations formed along two opposite side edges of the substrate to serve as external connection terminals, two rigid supporting plates mounted on the other side of the substrate, characterized in that the supporting plates are spaced apart from one another in the central region of the substrate in order to provide a flexible region which is such that the substrate is folded so that the two side edges are inserted into a recess in the mother board with said external connection terminals making appropriate electrical connections with said mother printed circuit board, the flexibility of said flexible region providing sufficient pressure to hold the circuit in said recess.

In a further aspect, the invention provides a hybrid integrated circuit for use in the aforesaid system, the circuit comprising a flexible insulative substrate, circuit conductor means formed on one surface of the substrate, circuit elements mounted on said one surface to said conductor means, and conductor terminations formed along two opposite side edges of the substrate to serve as electrical connection terminals, two rigid support plates mounted on the other side of the substrate, characterized in that the supporting plates are spaced apart from one another in the central region of the substrate to provide a flexible region which is such that the substrate can be folded so that the two side edges can be inserted into a recess of a printed circuit mother board to make

appropriate electrical connections therewith, the flexibility of the flexible region providing sufficient pressure to hold the circuit in said recess and maintain the electrical connections.

These and other objects, advantages and features of the invention will become more apparent hereinafter from a consideration of the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is an oblique view to describe the conventional art;

Fig. 2 is an oblique view of an example of a hybrid integrated circuit according to this invention;

Fig. 3 is a sectional view of the same;

Figs. 4 through 8 are sectional views describing examples of hybrid integrated circuits according to this invention;

Fig. 9 is an oblique view of another example of the same;

Fig. 10 is an oblique view to describe a method to mount a hybrid integrated circuit according to this invention; and

Fig. 11 is an oblique view of a mother printed circuit board on which a hybrid integrated circuit is mounted according to this invention.

Fig. 2 and Fig. 3 are oblique and side views of the hybrid integrated circuit by this invention, which are provided for easier understanding of the construction of the component.

The hybrid integrated circuit component by this invention has the following construction: On one surface of the flexible insulated substrate 5, circuit conductor 6 which constitutes a block circuit and conductor layers 7 and 7' which are located along two opposing sides of the substrate to serve as external connection terminals are fitted to form a flexible circuit board 8; On the rear surface of the flexible circuit board 8, hard supporting plates 9 are cemented with adhesives 10 so that part of the flexible circuit board 8A can be folded freely; On this substrate are mounted circuit elements 11 required for the construction of the circuit block, such elements being electrically connected with the circuit conductor 6 of the flexible circuit board 8.

Since lead wires are not used, this hybrid integrated circuit component permits effective utilization of the space where circuit elements are mounted and is free of inadequate connection of lead wires. In addition, since no alumina substrate is used, there are no dimensional constrains, which allows construction of large-scale block circuits.

Furthermore, since the flexible circuit board on which circuit elements are fitted is folded to be mounted on the mother printed circuit board when in use, circuit elements can be virtually placed on both sides of the substrate via the hard supporting plates, thereby making it possible to effectively use the space on the mother printed circuit board, which in turn permits high density of circuit substrate. Since the component can be fitted on the mother printed circuit board without using lead wires, the circuit substrate can be made thinner. In this way, the hybrid integrated circuit component has many advantages related to circuit construction.

The specific example of this hybrid integrated circuit component follows: polyimide film with excellent resistance against heat and bending is used for flexible insulated substrate 5; 35μm-thick copper foil is applied to the whole surface of the flexible substrate covered with polyimide film; unnecessary copper foil is removed e.g. by photo-etching; the flexible circuit board is made by forming circuit conductor and conductor layers which function as external connection terminals on the polyimide film; hard supporting plates are cemented on the polyimide film surface, which does not constitute the circuit conductor, with the use of urethane modified resin as adhesive having excellent resistance against heat and bending so that the center of the flexible circuit board can be folded freely; on the circuit conductor surface of the flexible circuit board beneath which hard supporting plates are cemented, various circuit elements required for block circuit construction such as leadless type resistors and condensers, miniature resin-molded transistors, and semiconductor ICs are temporarily fixed with adhesive and then soldered. By using materials of various quality and construction for hard supporting plates, depending on required characteristics of each circuit block, diverse circuit block modules can be produced.

Fig. 4 shows the sectional drawing of another example of the hybrid integrated circuit component by this invention, wherein metal plates 13 are used as hard supporting plates cemented on the rear surface of said flexible circuit board 8. This metal plate 13 is used for maintaining dimensional stability of the substrate and for improving radiation characteristic of the circuit block, and is especially effective in constructing a circuit block using circuit elements with large power dissipation. As materials for the metal plate, aluminum, copper, iron, etc. can be used.

By this invention it has been revealed that high, voltage circuit up to 500mW (max.) can be produced with the use of hybrid integrated circuit components having the construction described above.

However when metal plates 13 are cemented on the rear surface of the flexible circuit board to construct a circuit block as described in the preceding example, stray capacity is generated between the circuit conductor 6 of the flexible circuit board 8 and the metal substrate 13, which prevents the emergence of required circuit characteristics. This means that the circuit conductor of the flexible circuit board and the metal plate must be connected electrically. In such a case, holes are bored in the circuit conductor 6 of the flexible circuit board 8 requiring connection so that the conductor is electrically connected with the metal plate 13 by means of solder 14, as illustrated in Fig. 4.

It must be noted in this connection that solder does not adhere to aluminum or iron, when such

materials are used for the metal plate. When such materials are used, a copper foil 15 capable of soldering must be cemented on the whole surface of the metal plate.

In this specific example, a copper foil 15 is applied to the whole surface of the metal plate which uses aluminium, for electrical connection with the circuit conductor of the flexible circuit board.

In another example as illustrated in Fig. 5, insulated substrates are used as hard supporting plates. As this insulated substrate, synthetic resin substrate 16 such as paper-phenol lamination or epoxy lamination, is used. The insulated substrate is used not only for economy but also to prevent deterioration of circuit characteristics which would otherwise be caused by soldering heat when mounting the hybrid integrated circuit component onto the mother printed circuit board by means of soldering.

In yet another example as illustrated in Fig. 6, a multi-layered construction is made by forming a circuit shape conductor layers 17 on the surface of the above-mentioned synthetic resin substrate 16 and by electrically connecting the circuit conductor 17 with the circuit conductor 6 of the flexible circuit board by means of soldering 18 through the hole bored in the flexible circuit board. Such multi-layered circuit construction permits high density of the circuit block.

It was also confirmed that in addition to soldering, silver-type conductive paste can be employed for electrical connection between the circuit conductor 6 of the flexible circuit board 8 and the circuit conductor 17 on the synthetic resin substrate 16 which serves as hard supporting plate.

In another example as shown in Fig. 7 alumina substrate 19 is used as insulated substrate; the thick film circuit substrate is formed by printing and burning at high temperature the silver-palladium type circuit conductor 20 and ruthenium oxide type resistor layers 21 on the surface of the alumina substrate 19; and thus produced thick film circuit substrate is used as hard supporting plate. Multi-layered circuit construction is made by connecting the circuit conductor 20 on the alumina substrate by means of soldering 22 through the hole bored in the circuit conductor 6 of the flexible circuit board, in order to achieve higher density of the circuit block. It is also confirmed that the circuit conductor 6 of the flexible circuit board 8 and the circuit conductor 20 of the alumina substrate 18 can be connected with conductive paste.

In another example of use as shown in Fig. 8, the flexible circuit board 8 constituting the hybrid integrated circuit component by this invention is so constructed that the surface of the flexible circuit board is covered with a flexible, insulating sheet 23. The purpose of this insulating sheet is to protect circuit conductor on the flexible circuit board and to prevent disconnection of the copper foil patterns on the bending portion of the flexible circuit board. In addition, it has been revealed that the use of the insulating sheet improves spring characteristic of the bending portion, thereby facilitating mounting of the component onto the mother printed circuit board, and plays an important role to ensure perfect soldering. Furthermore, it has been revealed that the application of the flexible insulating sheet 23 only to the bending portion of the flexible circuit board, as illustrated in Fig. 8, is effective enough, although the flexible insulating sheet may be applied to almost the entire surface of the circuit conductor on the flexible circuit board.

Fig. 9 shows the construction of the external connection terminal of the hybrid integrated circuit component by this invention. This external connection terminal is characterized in that a rectangular notch 24 is made between connection terminals which are arranged along two opposing sides of the circuit block so that the connection terminals on the right and left sides of the notch are positioned asymmetrically.

The above-mentioned terminal construction prevents the circuit block module from being mounted on the mother printed circuit board in wrong direction.

Thus, a hybrid integrated circuit component by this embodiment is characterized in that: the flexible circuit board and hard supporting plates are combined skillfully; circuit elements required to constitute a block circuit are mounted on the substrate which is made by cementing hard supporting plates beneath the flexible circuit board so that part of the board can be folded freely; and the external connection terminals do not have lead wires which would otherwise be provided at equal intervals along two opposing sides of the flexible circuit board in parallel with the bending portion of the flexible circuit board.

Accordingly, in mounting this hybrid integrated circuit component on the mother printed circuit board, the flexible circuit board 8 must be bent outwards by 180 degrees, so that the bending portion 8A of the flexible circuit board 8 on which circuit elements 11 are mounted is the center of bending and that the hard supporting plates 9 come in close contact with each other, as illustrated in Fig. 10. Then, while keeping the condition in which the circuit elements 11 are mounted on both sides of the doubled supporting plates 9, the connection terminals 7 and 7' must be inserted into the slit 26 of the mother printed circuit board 25, which must then be immersed in a molten solder bath.

The feature of the method to mount a hybrid integrated circuit component by this invention is that insertion of the connection terminals into the mother circuit board is facilitated by maintaining a large clearance between the connection terminals and the slit and that connection with the mother printed circuit board can be ensured. This is because the bending portion of the flexible circuit board has a spring characteristic.

To be more precise, the hybrid integrated circuit component by this invention before mounting on the mother printed circuit board is composed of a circuit block which is constructed on

one plane. When this flexible circuit board is bent for insertion into the mother printed circuit board, the flexible circuit board tends to restore its original flat state. Therefore, when the connection terminals are inserted into the slit of the mother printed circuit board, the connection terminals are in sufficient contact with the slit, even if the clearance is large. This is why "floating" of the circuit block or inadequate soldering can be completely eliminated. It has been revealed that spring force can be increased by applying a flexible insulating sheet onto the bending portion of the flexible circuit board as shown in Fig. 8.

The advantages of the hybrid integrated circuit component by this invention can be best appreciated when it is mounted on a mother printed circuit board as illustrated in Fig. 11. Since the hybrid integrated circuit mounted on the mother printed circuit board is directly connected with the connection terminal of the mother printed circuit board by means of soldering, the mother printed circuit board and the circuit block can be connected firmly. In addition, since the mounted circuit block does not protrude from the mother printed circuit board, the circuit can be made thinner. Furthermore, since the circuit block is so mounted on the mother printed circuit board that the circuit block is positioned on both sides of the doubled hard supporting plates, high density on the mother printed circuit board can be achieved.

On summarising the foregoing, the hybrid integrated circuit component by this invention is composed of a flat block circuit of leadless construction. By making the best of the characteristics of the flexible circuit board, mounting work on the mother printed circuit board is made easier and secure. Furthermore, high density and reliability are achieved as the hybrid integrated circuit component is mounted on the mother printed circuit board. Therefore, it is possible to produce compact, lightweight and highly reliable electronic equipment.

Various modifications can be made. For example, depending on the number of circuit elements required and their disposition, only one supporting plate may be needed. Additionally, when mounting the hybrid circuit on a circuit board, it may be advantageous in some circumstances to use an edge connector socket for receiving the hybrid circuit rather than the slit in the board as has been described. Thus, the soldering step is not essential.

Claims

1. An electrical connection system of connecting a hybrid integrated circuit (8) to a mother printed circuit board (25), the hybrid integrated circuit comprising a flexible insulative substrate (5), circuit conductor means (6) formed on one surface of the substrate, circuit elements (11) mounted on said one surface to said conductor means, and conductor terminations (7, 7') formed along two opposite side edges of the substrate to serve as external connection terminals, two rigid supporting plates (9) mounted on the other side of the substrate, characterized in that the supporting plates are spaced apart from one another in the central region of the substrate in order to provide a flexible region (8A) which is such that the substrate is folded so that the two side edges are inserted into a recess (26) in the mother board (25) with said external connection terminals making appropriate electrical connections with said mother printed circuit board, the flexibility of said flexible region providing sufficient pressure to hold the circuit in said recess.

2. A hybrid integrated circuit (8) for use in the system as claimed in claim 1, the circuit comprising a flexible insulative substrate (5), circuit conductor means (6) formed on one surface of the substrate, circuit elements (11) mounted on said one surface to said conductor means, and conductor terminations (7, 7') formed along two opposite side edges of the substrate to serve as electrical connection terminals, two rigid support plates (9) mounted on the other side of the substrate, characterized in that the supporting plates are spaced apart from one another in the central region of the substrate to provide a flexible region (8A) which is such that the substrate can be folded so that the two side edges can be inserted into a recess (26) of a printed circuit mother board (25) to make appropriate electrical connections therewith, the flexibility of the flexible region providing sufficient pressure to hold the circuit in said recess and maintain the electrical connections.

3. A hybrid integrated circuit as claimed in claim 2, wherein two metal plates (13) are employed as said two rigid plates and said metal plates are electrically connected to said circuit conductor means of said flexible circuit board.

4. A hybrid integrated circuit as claimed in claim 2, wherein two insulative substrates (16) are used as said two rigid plates.

5. A hybrid integrated circuit as claimed in claim 4, wherein a circuit conductor means (17) is formed on a surface of each of said insulative substrates used as said rigid plates, and each circuit conductor means is electrically connected with said circuit conductor means of said flexible circuit board.

6. A hybrid integrated circuit as claimed in claim 4, wherein a circuit conductor means (20) and resistor layers (21) are formed on a surface of each of said insulative substrates used as said rigid plates, and these circuit conductor means and resistor layers are electrically connected with said circuit conductor means of said flexible circuit board.

7. A hybrid integrated circuit as claimed in claim 2, wherein the folded portion of said flexible circuit board is covered with a flexible insulating sheet (23) so as to enhance the spring force arising in the flexible region when the substrate is folded.

8. A hybrid integrated circuit as claimed in claim 7, wherein a part of said circuit conductor means is covered with the said flexible insulating sheet.

9. A hybrid integrated circuit component as claimed in claim 2, wherein a rectangular notch (24) is provided asymmetrically in each of said conductor terminations which serve as external connection terminals.

10. A system as claimed in claim 1, wherein an edge connector socket is mounted on the printed circuit board and provides said recess.

Patentansprüche

1. Elektrisches Verbindungssystem zum Verbinden einer hybriden integrierten Schaltung (8) mit einer Mutterdruckschaltkarte (25), wobei die hybride integrierte Schaltung ein flexibles, isolierendes Substrat (5), auf einer Seite des Substrats ausgebildete Schaltungsleitereinrichtungen (6), auf der genannten einen Seite auf den Leitereinrichtungen befestigte Schaltkreiselemente (11) und Leiteranschlüsse (7, 7') längs zweier gegenüberliegender Seitenränder des Substrats, die als äußere Verbindungsanschlüsse dienen, aufweist, wobei zwei steife Tragplatten (9) auf der anderen Seite des Substrats befestigt sind, dadurch gekennzeichnet, daß die Tragplatten voneinander im mittleren Bereich des Substrats beabstandet angeordnet sind, um einen flexiblen Bereich (8A) auszubilden, der derart ist, daß das Substrat so gefaltet ist, daß die zwei Seitenränder in eine Ausnehmung (26) in der Mutterkarte (25) eingesetzt sind, wobei die genannten äußeren Verbindungsanschlüsse geeignete elektrische Verbindungen mit der Mutterdruckschaltkarte herstellen, wobei die Flexibilität des flexiblen Bereichs einen ausreichenden Druck erzeugt, um die Schaltung in der Ausnehmung zu halten.

2. Hybride integrierte Schaltung (8) zur Verwendung in dem System nach Anspruch 1, die Schaltung enthaltend ein flexibles isolierendes Substrat (5), Schaltungsleitereinrichtungen (6) auf einer Seite des Substrats, Schaltkreiselemente (11), die auf der genannten einen Seite an den Leitereinrichtungen befestigt sind, und Leiteranschlüsse (7, 7'), die längs zweier gegenüberliegender Seitenränder des Substrats ausgebildet sind und als elektrische Verbindungsanschlüsse dienen, wobei zwei steife Tragplatten (9) auf der anderen Seite des Substrats befestigt sind, dadurch gekennzeichnet, daß die Tragplatten voneinander im mittleren Bereich des Substrats Abstand haben, um einen flexiblen Bereich (8A) auszubilden, der derart ist, daß das Substrat so gefaltet werden kann, daß die zwei Seitenränder in eine Ausnehmung (26) einer Mutterdruckschaltkarte (25) eingesetzt werden können, um dort geeignete elektrische Verbindungen herzustellen, wobei die Flexibilität des flexiblen Bereichs einen ausreichenden Druck bereitstellt, um die Schaltung in der genannten Ausnehmung zu halten und die elektrischen Verbindungen aufrechtzuerhalten.

3. Hybride integrierte Schaltung nach Anspruch 2, bei der zwei Metallplatten (13) als die zwei steifen Platten verwendet sind und die Metallplatten elektrisch mit den Schaltungsleitereinrichtungen der flexiblen Schaltungskarte verbunden sind.

4. Hybride integrierte Schaltung nach Anspruch 2, bei der zwei isolierende Substrate (16) als die zwei steifen Platten verwendet sind.

5. Hybride integrierte Schaltung nach Anspruch 4, bei der eine Schaltungsleitereinrichtung (17) auf einer Seite eines jeden der isolierenden Substrate, die als die steifen Platten verwendet sind, ausgebildet ist und jede Schaltungsleitereinrichtung elektrisch mit der Schaltungsleitereinrichtung der flexiblen Schaltungskarte verbunden ist.

6. Hybride integrierte Schaltung nach Anspruch 4, bei der eine Schaltungsleitereinrichtung (20) und Widerstandsschichten (21) auf einer Seite eines jeden der isolierenden Substrate, die als die steifen Platten verwendet sind, ausgebildet sind, und diese Schaltungsleitereinrichtung und die Widerstandsschichten elektrisch mit der Schaltungsleitereinrichtung der flexiblen Schaltungskarte verbunden sind.

7. Hybride integrierte Schaltung nach Anspruch 2, bei der der gefaltete Abschnitt der flexiblen Schaltungskarte mit einer flexiblen isolierenden Folie (23) bedeckt ist, um die Federkraft zu verstärken, die in dem flexiblen Bereich auftritt, wenn das Substrat gefaltet wird.

8. Hybride integrierte Schaltung nach Anspruch 7, bei der ein Teil der Schaltungsleitereinrichtung mit der flexiblen isolierenden Folie bedeckt ist.

9. Hybride integrierte Schaltungskomponente nach Anspruch 2, bei der eine rechteckige Kerbe (24) asymmetrisch in jedem der Leiteranschlüsse, die als äußere Verbindungsanschlüsse dienen, vorgesehen ist.

10. System nach Anspruch 1, bei dem ein Randverbindersockel auf der Druckschaltkarte montiert ist und die genannte Ausnehmung bildet.

Revendications

1. Un système de connexion électrique pour connecter un circuit électrique hybride (8) à une carte mère de circuit imprimé (25), le circuit intégré hybride comprenant un substrat isolant flexible (5), une structure de conducteurs de circuit (6) formée sur une première surface du substrat, des éléments de circuit (11) montés sur la structure de conducteurs sur la première surface, et des terminaisons de conducteurs (7, 7') formées le long de deux bords latéraux opposés du substrat, pour faire fonction de bornes de connexion externes, avec deux plaques de support rigides (9) montées sur l'autre face du substrat, caractérisé en ce que les plaques de support sont mutuellement espacées dans la région centrale du substrat, de façon à définir une région flexible (8A) qui est conçue de façon à permettre de plier le substrat pour introduire les deux bords latéraux dans une cavité (26) dans la carte mère (25), avec les bornes de connexion externes établissant des connexions électriques appropriées avec la carte mère de circuit imprimé, la flexibilité de la région flexible produisant une pression

suffisante pour maintenir le circuit dans la cavité.

2. Un circuit intégré hybride (8) prévu pour l'utilisation dans le système selon la revendication 1, le circuit comprenant un substrat isolant flexible (5), une structure de conducteurs de circuit (6) formée sur une première surface du substrat, des éléments de circuit (11) montés sur la structure de conducteurs sur la première surface, et des terminaisons de conducteurs (7, 7') formées le long de deux bords latéraux opposés du substrat, pour remplir la fonction de bornes de connexion électriques, avec deux plaques de support rigides (9) montées sur l'autre face du substrat, caractérisé en ce que les plaques de support sont mutuellement espacées dans la région centrale du substrat, pour définir une région flexible (8A) qui est conçue de façon qu'on puisse plier le substrat afin de pouvoir introduire les deux bords latéraux dans une cavité (26) d'une carte mère de circuit imprimé (25), pour établir des connexions électriques appropriées avec cette dernière, la flexibilité de la région flexible produisant une pression suffisante pour maintenir le circuit dans la cavité et pour maintenir les connexions électriques.

3. Un circuit intégré hybride selon la revendication 2, dans lequel on utilise deux plaques de métal (13) pour les deux plaques rigides, et ces plaques de métal sont connectées électriquement à la structure de conducteurs de circuit de la carte de circuit flexible.

4. Un circuit intégré hybride selon la revendication 2, dans lequel on utilise deux substrats isolants (16) pour les deux plaques rigides.

5. Un circuit intégré hybride selon la revendication 4, dans lequel une structure de conducteurs de circuit (17) est formée sur une surface de chacun des substrats isolants qui sont utilisés en tant que plaques rigides, et chaque structure de conducteurs de circuit est connectée électriquement à la structure de conducteurs de circuit de la carte de circuit flexible.

6. Un circuit intégré hybride selon la revendication 4, dans lequel une structure de conducteurs de circuit (20) et des couches de résistances (21) sont formées sur une surface de chacun des substrats isolants utilisés en tant que plaques rigides, et cette structure de conducteurs de circuit et ces couches de résistances sont connectées électriquement à la structure de conducteurs de circuit de la carte de circuit flexible.

7. Un circuit intégré hybride selon la revendication 2, dans lequel la partie pliée de la carte de circuit flexible est recouverte par une feuille isolante flexible (23), de façon à renforcer la force élastique qui apparaît dans la région flexible lorsque le substrat est plié.

8. Un circuit intégré hybride selon la revendication 7, dans lequel une partie de la structure de conducteurs de circuit est recouverte par la feuille isolante flexible.

9. Un composant consistant en un circuit intégré hybride selon la revendication 2, dans lequel une encoche rectangulaire (24) est formée en position dissymétrique dans chacune des terminaisons de conducteurs qui font fonction de bornes de connexion externes.

10. Un système selon la revendication 1, dans lequel un réceptable pour connecteur plat est monté sur la carte de circuit imprimé et définit la cavité précitée.

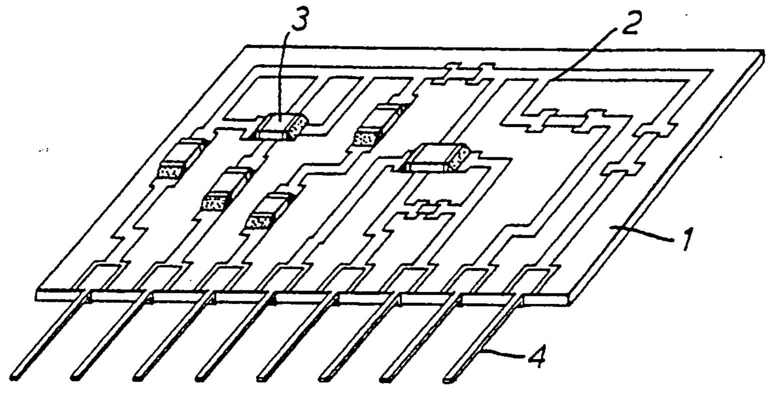

FIG. 1.

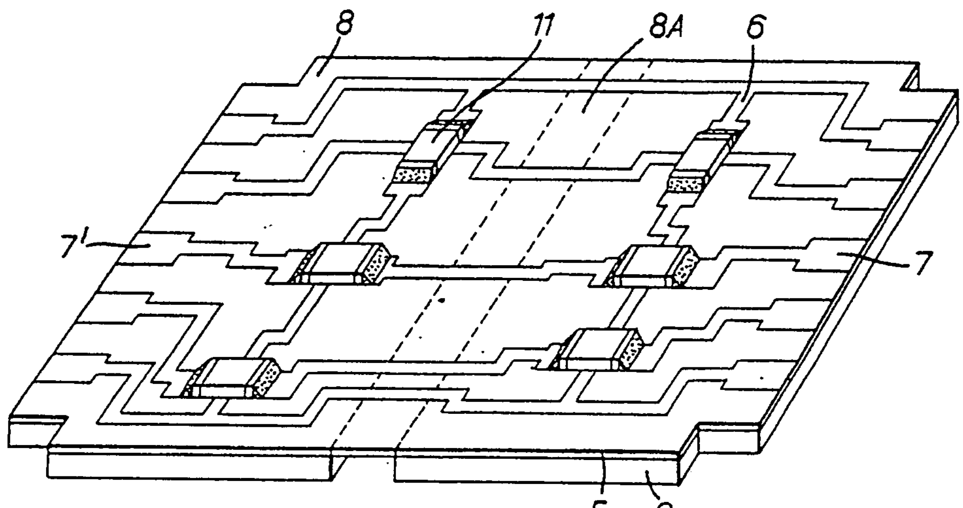

FIG. 2.

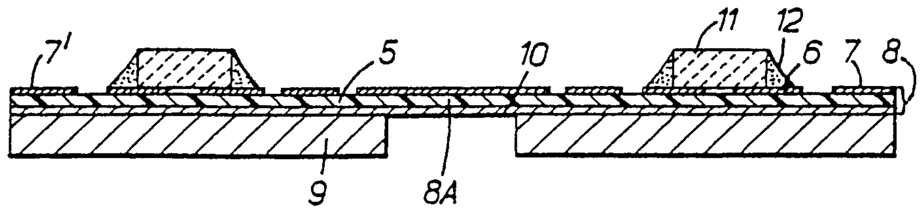

FIG. 3.

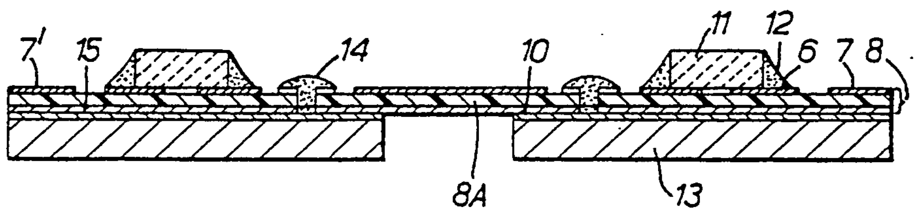

FIG. 4.

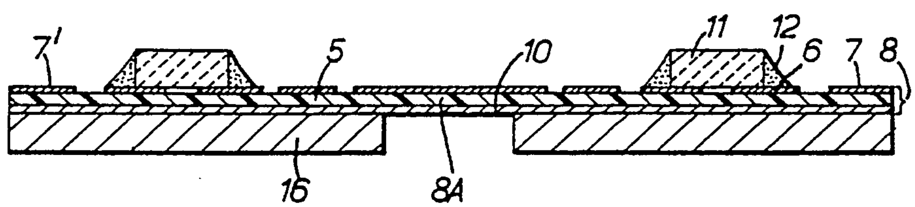

FIG. 5.

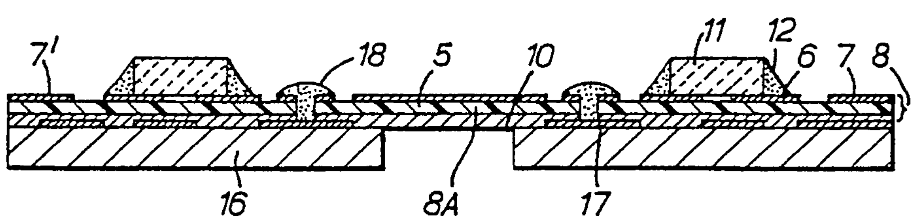

FIG. 6.

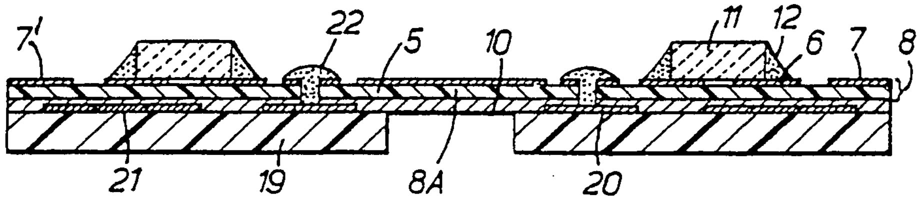

FIG. 7.

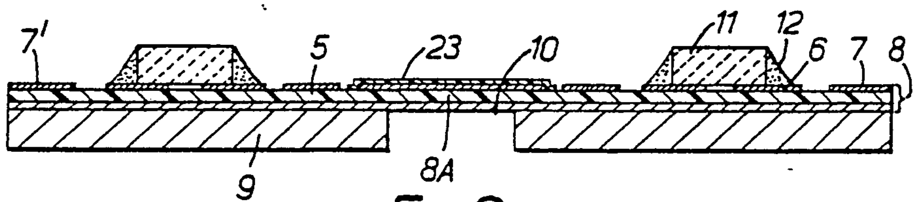

FIG. 8.

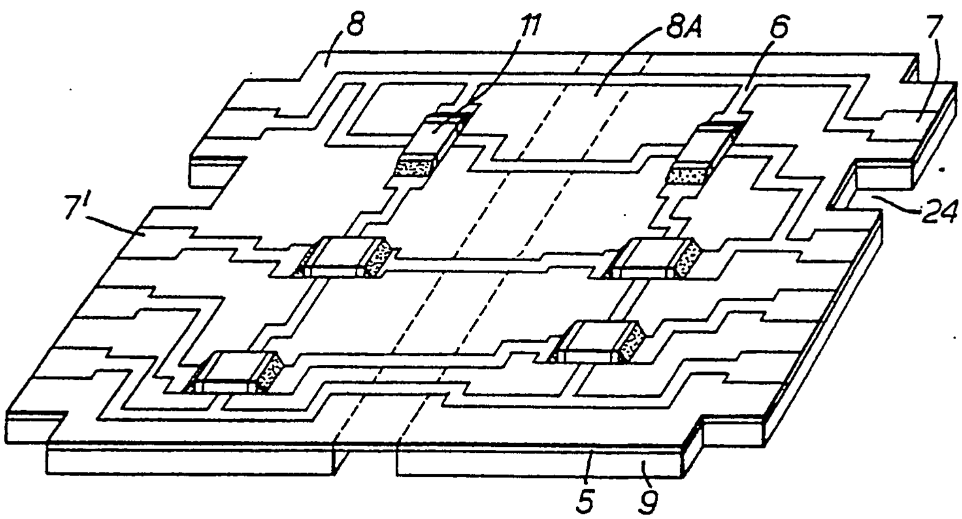

FIG. 9.

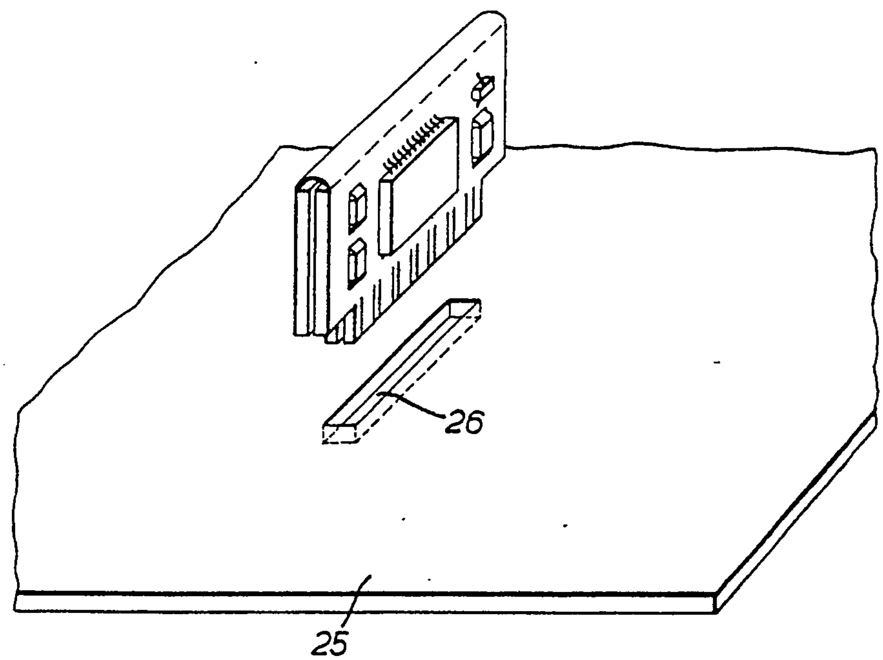

FIG. 10.